Emerging Distributed Resource Technologies - Target 33

Contract #: 500-00-023 **Project #:** 2 - 8
Contractor: Electric Power Research Institute (EPRI)
Subcontractors: Gas Research Institute : Nexant, Inc. : Energy International, Inc. : ADI Thermal Power Corporation : American Electric Power : PowerCo US, Inc. : Arthur D. Little, Inc. : National Rural Electric Cooperative Association : Power Computing Systems : Rolls-Royce, Inc. : Southern California Edison : EPRI PEAC Corporation
Project Amount: $461,251
Match Amount: $3,782,757
Contractor Project Manager: Dan Rastler (650) 855-2521
Commission Contract Manager: Jairam Gopal (916) 654-4880
Status: Completed

Project Description:
The purpose of this project is to promote the potential that distributed resources (DR) have to provide a substantial portion of the energy alternatives now demanded by California electricity users. Both energy service providers and customers need accurate and unbiased information on the benefits and liabilities associated with commercially available and emerging distributed resource technologies. DR technologies offer third-party energy service providers and energy customers innovative solutions to their energy service needs. EPRI's Emerging DR Technologies target provides detailed information on commercially mature reciprocating engines and gas turbines, and emerging microturbines and fuel cell systems technologies. To gather this information, EPRI assesses advanced DR components, performs technology validations, and leads pre-commercial development of technologies that offer high pay-off. As a member, the Energy Commission will obtain intelligence in three distinct areas: rapid changes in technology, development of new distributed resources, and post-R&D commercialization initiatives. This target examines a balanced portfolio of near, intermediate, and long-term options.

This project supports the PIER Program objectives of:

- Improving the reliability/quality of California's electricity by developing generation options that energy providers can utilize to provide unique solutions for peaking power issues, to enhance system reliability (system voltage control), and to assure power quality to their customers.
- Improving the energy cost/value of California's electricity by assisting in the development of innovative distributed resource technologies that can potentially provide lower delivered cost electricity than central station power.
- Improving the environmental and public health costs/risks of California's electricity by assisting in developing fuel cell systems and other environmentally preferred generation technologies to replace traditional central station power.

Proposed Outcomes:

1. Provide unbiased accurate information on emerging DR technologies to increase customer choice and enable competition.
2. Provide methods and guidelines for comparing and testing technologies to improve evaluation of emerging DR technologies.
3. Accelerate development and application of advanced engines for power generation and T&D support through monitoring of technology development and benchmarking of new products.
4. Support application of small gas turbine technology (1-10 MW) by documenting existing installations.

5. Accelerate the development of microturbine technologies by documenting the performance of current and emerging microturbines.
6. Bring to market readiness fuel cell technologies that include polymer electrolyte membrane (PEM) fuel cell systems and ultra-high efficient solid oxide fuel cells (SOFC).
7. Accelerate development of fuel cell energy storage systems through technology assessment and preliminary system design.
8. Ensure the efficient and safe application of distributed resources by compiling up-to-date information on interconnection hardware.
9. Conduct a Tailored Collaboration (TC) project entitled "Emissions Testing and Certification Guidelines for DG Generators."

Actual Outcomes:

1. Unbiased Information.
   - A quarterly newsletter—*Strategic Intelligence Update: Technology Development*—was published on the latest breaking information on DR technology and research development.
   - An online version of *EPRI Distributed Resources Technical Assessment Guide (DR-TAG)* was made available to CEC staff. The web-based Guide includes information on product configurations, technology status, development issues, and prospects for future improvements.
   - A technical report—*Enhancing DR Value Through Heat Recovery* (1003958)— was published on heat recovery options that could improve the performance and efficiency of DR technology.
   - The 2nd Annual Business Venture Forum, an annual national workshop, was held July 25-26 in San Francisco. It provided a forum for utilities, energy companies, equipment manufacturers, and vendors to discuss the latest technology, market, and policy developments.
   - Advisory Group Meetings were held in February, July, and October.
2. Evaluation Guide.
   - The *Guide for Test and Evaluation of DR Technology Performance* (1003963) was published, providing a uniform methodology and references for consistent evaluating and testing of emerging DR technologies.
3. Advanced Engines.
   - A report—*Insights on Development of Advanced IC Engines* (1003959)—was published to report on state-of-the-art engine technology under development at manufacturers, U.S national laboratories, and universities. The report assesses engine R&D activities for their potential to improve engine performance and/or reduce emissions.
   - A report—*Performance Data: Benchmarking of New and Emerging Engine Products* (1003960)—was published on performance characteristics of leading engine products from every major reciprocating engine manufacturer.
   - A report—*Case Studies of IC Engines for T&D Support* (1003961)—was published on utility application experiences and lessons learned with engines and combustion turbines used for T&D support.
4. Small Gas Turbines (1-10 MW) for Distributed Power Markets.
   - A report—*Case Studies of CTs for T&D Support* (1003962)—was published to document one utility's efforts to select, site, install, and operate a mobile combustion turbine at a rural substation.
5. Microturbines.
   - A report—*Performance and Electrical Characterization Tests on a Microturbine Commercial Prototype: Part III* (1003964)—was published to characterize operation of a grid parallel/grid independent commercial MTG.

• A report—*MTG Field Test Program* (1006394)—was published to ascertain the cost, performance, durability, reliability, and maintainability of various microturbines in an actual customer environment.
• A report—*Test and Evaluation of Two Microturbines at Customer Sites* (1006591)—was published to report the test results of two microturbines operating at customer sites. Also, to report the problems and other challenges encountered, along with customer viewpoints.

6. Fuel Cell Distributed Power Systems.
   • A report—*Assessment of SOFC-CT Hybrids* (1003965)—was published on the technical and performance characteristics of a 250-kW SOFC-microturbine system.
   • A report—*Assessment of SOFC Systems for C&I Applications* (1003966)— was published to provide validated bench-scale and field test data on small SOFC cogeneration systems.
   • A report—*5 kW Fuel Cell for Telecom and Residential Markets* (1003967)— is in process, and will be published March 31, 2002. The report will describe performance, cost, and durability information on emerging residential fuel cell systems.
   • A report—*50-kW PEM Prototype Fuel Cell System, Interim Report* (1003968)—is in process and will be published March 31, 2002. The report will describe the performance of PEM fuel cell systems for commercial and industrial applications.
7. Fuel Cell–Energy Storage Systems.
   • A report—*Technology Assessment of Fuel Cell–Energy Storage Systems* (1004544)—was published, detailing the performance of a PEMFC-Ultracapacitor system for stationary battery replacement markets.
8. Interconnection Hardware.
   • A report—*Technology Assessment of Interconnection Products for Distributed Resources* (1003969)—was published to provide an annual report on vendors, product development efforts, and R&D issues related to interconnection and switchgear technology.
   • A report—*Capacitor-Stabilized Soft Transfer Interface System for Distributed Resources* (1003970)—was published to report on development and testing of a prototype device that can improve the performance, reliability, and economics of DR systems.

Project Status:
The project has been completed.